A joint for a panel.

The present invention relates to a joint for a panel which are assembled together with separate joining profiles.

Prefabricated floor boards provided with tongue and groove at the edges are quite common nowadays. These can be installed by the average handy man as they are very easy to install. Such floors can, for example, be constituted of solid wood, fibre board or particle board. These are most often provided with a surface layer such as lacquer, or some kind of laminate. The boards are most often installed by being glued via tongue and groove. The most common types of tongue and groove are however burdened with the disadvantage to form gaps of varying width between the floor boards in cases where the installer hasn't been thorough enough. Dirt will easily collect in such gaps. Moisture will furthermore enter the gaps which will cause the core to expand in cases where it is made of wood, fibre board or particle board, which usually is the case. The expansion will cause the surface layer to rise closest to the edges of the joint which radically reduces the useful life of the floor since the surface layer will be exposed to an exceptional wear. Different types of tensioning devices, forcing the floor boards together during installation can be used to avoid such gaps. This operation is however more or less awkward. It is therefore desirable to achieve a joint which is self-guiding and thereby automatically finds the correct position. Such a joint would also be possible to utilise in floors where no glue is to be used.

Such a joint is known through WO 94/26999 which deals with a system to join two floor boards. The floor boards are provided with a locking device at the rear sides. It is, however, shown in the figures with accompanying description that the floor boards are provided with profiles on the lower side at a first long side and short side. These profiles, which extends outside the floor board itself, is provided with an upwards directed lip which fits into grooves on the lower side of a corresponding floor board. These grooves are arranged on the second short side and long side of this floor board. The floor boards are furthermore provided with a traditional tongue and groove on the edges. The intentions are that the profiles shall bend downwards and then to snap back into the groove when assembled. The

profiles are integrated with the floor boards through folding or alternatively, through gluing.

The invention according to WO 94/26999 is however burdened with the disadvantage that the profiles are located in a very exposed position and will easily be damaged during handling. According to WO 94/26999, the floor boards may be joined without the lip having to touch the contact surface of the groove at tolerances as small as ± 0.2 mm. The profiles are easily deformed during manufacturing, transport and installation of the relatively heavy floor boards since the profiles are located in a very exposed position. Further deformation of the delicate joining profiles is probable since the intentions are that it should be possible to disassemble and reinstall the floor boards according to WO 94/26999. Such deformation will obstruct, and in serious cases even make assembly of the floor boards impossible.

It seems, from WO 94/26999 to be desired to have a clearance between the contact surfaces of the lip and the groove. A tolerance of ±0.2mm is mentioned in the application. The clearance seems to be marked Δ in the figures. Such a clearance will naturally cause undesired gaps between the floor boards. Dirt and moisture can penetrate into these gaps.

Another disadvantage is that the tongue, located on two of the edges, must be tooled from the base material which will loss of the surface layer. Such a surface layer will most often be constituted of thermosetting laminate and is normally the most costly part of a laminate floor. A surface layer of thermosetting laminate will furthermore cause an extensive wear on the tools used for milling.

Another disadvantage becomes clear when performing a life-cycle analysis on the floor boards according to WO 94/26999. According to one preferred embodiment of WO 94/26999, the joining profile is constituted of aluminium. Since it constitutes a part integrated with the floor board it will be practically impossible to recycle the floor board without a very labour-intensive process. The inevitable cutting of the floor board will also be very difficult, utilising common tools, as both aluminium, thermosetting laminate and core will have to be cut at the same time.

It is also known through WO 97/47834 to manufacture a joint where the floor boards are joined so that they are locked together in the horizontal direction.

According to this invention a traditional tongue has been provided with heel on the lower side. The heel has a counterpart in a recess in the groove of the opposite side of the floor board. The lower cheek of the groove will be bent away during the assembly and will then snap back when the floor board is in the correct position. The snap-joining parts, i.e. the tongue and groove, is in opposite to the invention according to WO 94/26999 above, where they are constituted by separate parts, seems to be manufactured monolithically from the core of the floor board. WO 97/47834 does also show how the tongue and groove with heels and recesses according to the invention is tooled by means of cutting machining. This invention does also have the disadvantage that the tongue, and particularly, the lower cheek of the groove will easily be damaged during normal handling even though they protrudes less than in the invention according to WO 94/26999 above.

Also WO 97/47834 does have the disadvantage that both tongue and groove will have to be tooled in a way that causes loss of the costly top surface. This tooling will also cause an extensive wear on tools used.

The invention according to WO 97/47834 presumes a certain amount of resilient properties in the core material. The material normally used is not very suitable if a resilient property is desired. MDF (medium density fibre board) or HDF (high density fibre board) should according to WO 97/47834 be suitable as core material. The resilient properties of these materials are however, rather poor, whereby the risk for crack formation, parallel to the top surface, ought to be great. The invention according to WO 93/13280 deals with a form of clip intended to be used for holding floor boards together. The floor boards are, besides being provided with a traditional tongue and groove, with known disadvantages, also provided with a single groove on the lower side of the floor board. The floor boards rests on the clip whereby a great number of clips will have to be used as the floor otherwise will be resilient. The distance formed between the floor boards and the surface beneath will furthermore cause acoustic resonance. This will give the floor a noisy character and a higher sound level. This is not desired.

The different types of floor panels described above are all of the type known as floating floor installations. This means that the panels are attached, one to the other but not to the subjacent subfloor. Such a floating floor is allowed to expand and contract with change in moisture content. Such changes in moisture content

will demand that there is sufficient space between the circumscribing edge of the floor installation and the surrounding walls. These space are normally covered by mouldings but in larger rooms and long corridors it will be necessary to install so called dilatation profiles to take up the naturally occurring movement in the floating floor. These dilatation devices are normally bulky and aren't always a welcome feature in the interior design. It is also important to take good care of items like water pipes for radiators coming up through the floor. It has occurred that such pipes have been caused to leak by expanding floating floor installations.

Another known problem is when for example a heavy book shelf is placed in one end of a room and a heavy piano is placed on the opposite end of the room after a warm wet summer. Once the moisture content in the panels decreases in the late autumn, the floor will try to move the piano and book shelf closer to each other. If it does not succeed in this attempt, and it seldom does, undesired cracks will appear in the floor.

The above mentioned problems are solved through the present invention, whereby a joint for a panel where a predetermined amount of expansion and contraction in the panel is absorbed in the joint is achieved. Accordingly the joint comprising a first edge and a second edge whereby the first edge comprises a groove and the second edge is provided with a tongue. The second edge further comprises an upper side groove. A joining profile is provided with a tongue and an intermediate section. The joining profile is so configured so as to allowing it to be located in the upper portion of the joint between two, joined, adjacent panels.

According to another embodiment of the invention the joint comprises a first edge and a second edge whereby the first edge comprises a groove and the second edge is provided with a tongue. The invention is characterised in that the first edge further comprises an upper side groove and the second edge also comprises a upper side groove. A joining profile is provided with a first and second snapping tongue and an intermediate section. The joining profile is so configured so as to allowing the first and second snapping tongue to be fitted into upper side grooves of two, joined, adjacent panels.

The joint preferably further comprises mating surfaces. The joining profile and the upper side grooves are so configured that a play is created in the joint between

the mating surfaces. This play is designed so that the distance between the mating surfaces is very small when the moisture level in the panel is at its highest practical level. The distance will be at its largest when the panel has low or no moisture content. The play is suitably in the range 0.05 - 1 mm. A play of up to 1 mm is rather easy to take up in the joining profile without changing its visual appearance to much.

The herein described joint may be used on every panel and every edge thereof in a floor installation. However it is also possible to use it on portions thereof such as only every other panel and only on long side edges thereof. The joint can also be used as a design feature. It is through the present invention possible to achieve dilatation in a floating floor which is flush with the upper surface of the floor. This is highly desired.

The tongue and the groove are configured to limit the movement in a vertical direction between two adjacent panels, while the joining profile and the upper side grooves are configured to limit the movement in horizontal direction between two adjacent panels.

A portion arranged between the upper side groove and its respective distal edge portion preferably comprises a recess. The recess may according to one embodiment of the invention further comprises one or more supporting protrusions. These supporting protrusions is intended for supporting a lower side of the intermediate section of the joining profile. The upper side groove is suitably provided with a first groove edge surface having an angle of 1 - 50° towards a vertical plane. The first groove edge surface will then create a pressure on an outer edge of the joining profile when two adjacent panels are forced together. This pressure causes the intermediate section to be urged downwards. A portion arranged between the upper side groove and its respective distal edge portion then comprises a recess being adapted to receive the lower portion of the intermediate section when being urged downwards.

The upper side groove is suitably provided with a first groove edge surface and a second groove edge surface between which first and second groove edge surfaces a

predetermined distance is present. The distance is so configured that the snapping tongue of the joining profile may be pressed in between the first and second groove edge surfaces. The first and second groove edge surfaces are preferably arranged so that an undercut is present. The snapping tongue of the joining profile is then adapted to the undercut so that a snap action locking effect is achieved.

According to one embodiment of the invention the tongue is provided with at least one protrusion and that the groove is provided with recesses arranged to mate with the at least one protrusion. The at least one protrusion with matching recess is then configured to allow a predetermined movement in the horizontal plane. This predetermined movement is suitably in the range 0.05 mm - 1 mm. The movement in each joint is of course depending on the maximum and minimum moisture levels in the panel as well as the distance between the joints according to the invention. However, an allowed movement of 1 mm / m of panel is more than enough.

The joining profile is configured to absorb the movement in adjacent floor panels. This may be achieved in two different ways. One way is to provide the joining profile with at least one compression zone. The joining profile or portions of the joining profile is here suitably made of an elastic material that will absorb the expansion of the panels. Another way is to allow the joining profile to bend, either upwards or downwards. It is here important to make sure that the joint is not allowed to expand more than the predetermined play to avoid undesired gaps between the panel and joining profile.

The joining profiles are suitably shaped as extended profiles which may be manufactured through extrusion which is a well known and rational method. The joining profiles are suitably shaped as extended lengths or rolls which can be cut to the desired length. The length of the joining profiles considerably exceeds the length of a floor element, before being cut. An advantage with such long profiles is that they can be laid over the whole width of the floor and will thereby reduce the risk for deviations and gaps in the floor since it bridges the lateral joints of the floor. Such bridging of the lateral joints can of course be used even if the joining profiles have the same length as, or is shorter than the floor elements. Shorter pieces of joining profiles is suitably used when it comes to the lateral joints of the floor.

Suitable materials are thermoplastic materials such as polyolefins, polystyrene, polyvinyl chloride or acrylnitril-butadiene-styrene-copolymer. These can suitably be filled with for example wood powder, lime or fibre such as glass fibre in order to increase the dimension stability. The top, visible surface of the joining profile may be decorated through any known means. It is however suitable to make this surface abrasion resistant enough to match the panels it is to be installed together with. It is also possible to make the joining profile of metal such as aluminium or steel. This profile may then be provided with a bellow-like structure to absorb the movement, have elastic portions of materials like rubber or being designed to bow downwards or upwards.

The invention is described further together with enclosed figures showing different embodiments of the invention whereby,

-figure 1a - 1c shows in cross-section a joint for a panel according to a first embodiment of the present invention.

-figure 2 shows in cross-section a joint for a panel according to a third embodiment of the present invention.

-figure 3 shows in cross-section a joint for a panel according to a third embodiment of the present invention.

-figure 4 shows in cross-section a joining profile for a panel according to an embodiment of the present invention.

-figure 5 shows in cross-section a joint for a panel according to a special embodiment of the present invention.

-figure 6 shows in cross-section a joint for a panel according to another special embodiment of the present invention.

Accordingly, figure 1a - c shows in cross-section a joint for a panel according to a first embodiment of the present invention. Figure 1 a shows the joint before

assembly wile figure 1b and 1c shows the same joint after the assembly. The joint is in figure 1b in relaxed state which it will have just after the assembly or when the panels have equilibrium moisture levels. In figure 1c the moisture levels in the panels are higher than normal which puts the joint under stress. The joint comprises a first edge 1 and a second edge 1^1 whereby the first edge 1 comprises a groove 11 and the second edge 1^1 is provided with a tongue 21. The first edge 1 further comprises an upper side groove 12. The second edge 1^1 comprises a upper side groove 12. A joining profile 3 is provided with a first and second snapping tongue 31 and an intermediate section 33. The joining profile 3 is configured so as to allowing the first and second snapping tongue 31 to be fitted into upper side grooves 12 of two, joined, adjacent panels. The joint further comprises mating surfaces 13 and 23 respectively. The joining profile 3 and the upper side grooves 12 are so configured that a play is created in the joint between the mating surfaces 13 and 23 respectively. The tongue 21 and the groove 11 are configured to limit the movement in a vertical direction between two adjacent panels while the joining profile 3 and the upper side grooves 12 are configured to limit the movement in horizontal direction between two adjacent panels.

A portion arranged between the upper side groove 12 and its respective distal edge portion comprises a recess. There is a predetermined distance between a first groove edge surface 16 and a second groove edge surface 17. The distance is so configured that the snapping tongue 31 may be pressed in between the first and second groove edge surfaces 16 and 17 respectively. The first and second groove edge surfaces 16 and 17 respectively are arranged so that an undercut is created. The snapping tongue 31 of the joining profile 3 is adapted to the undercut so that a snap action locking effect is achieved.

The joining profile 3 is provided with zones 34 which allows the profile to be compressed locally.

The panels most often comprises a core to which an upper decorative layer has been applied. The core often consists of wood particle or fibre bonded together by glue or resin. It might be advantageous to treat the surface closest to the joint in cases where the floor will be exposed to moisture, since the wood in the core is sensitive to moisture. This surface treatment may suitably include resin, wax or some kind of lacquer. It is not necessary to coat the joint if it is to be glued since the glue itself will protect the core from moisture penetration. The decorative

upper surface is constituted by a decorative paper impregnated with melamine-formaldehyde resin. One or more layers of so-called overlay papers made of α-cellulose, impregnated with melamine-formaldehyde resin are possibly placed on top of this. The abrasion resistance can be improved further by sprinkling one or more of the layers with hard particles of for example α-aluminium oxide, silicon carbide or silicon oxide in connection to the impregnation. The lower side may suitably be coated with lacquer or a layer of paper and resin.

Figure 2 corresponds mainly to the embodiment shown in figure 1. However, the central portion of the joining profile 3 is supported by supporting protrusions 15.

Figure 3a - 3c shows in cross-section a joint for a panel according to a third embodiment of the present invention. Figure 3a shows the joint before assembly wile figure 3b and 3c shows the same joint after the assembly. The joint is in figure 3b in relaxed state which it will have just after the assembly or when the panels have equilibrium moisture levels. In figure 3c the moisture levels in the panels are higher than normal which puts the joint under stress. The joint comprises a first edge 1 and a second edge 1^I. The first edge 1 comprises a groove 11 and the second edge 1^I is provided with a tongue 21. The first edge further comprises an upper side groove 12 and the second edge 1^I comprises a upper side groove 12. A joining profile 3 is provided with a first and second snapping tongue 31 and an intermediate section 33. The joining profile 3 is configured so as to allowing the first and second snapping tongue 31 to be fitted into upper side grooves 12 of two, joined, adjacent panels. The joint further comprises mating surfaces 13 and 23 respectively. The joining profile 3 and the upper side grooves 12 are so configured that a play is created in the joint between the mating surfaces 13 and 23 respectively. The size of this play is of course depending on the moisture content in the installed panels. The tongue 21 and the groove 11 are configured to limit the movement in a vertical direction between two adjacent panels while the joining profile 3 and the upper side grooves 12 are configured to limit the movement in horizontal direction between two adjacent panels. The tongue 21 is further provided with one protrusion 27 on the lower side of the tongue 21. The groove 11 is provided with a recess 18 arranged to mate with the

protrusion 27. The protrusion 27 with matching recess 17 is configured to allow a predetermined movement in the horizontal plane. A portion P arranged between the upper side groove 12 and its respective distal edge portion E comprises a recess 14. The recess 14 is adapted to receive the lower portion of the intermediate section 33 when being urged downwards. The upper side groove 12 is provided with a first groove edge surface 16 having an angle α of 1 - 50° towards a vertical plane. The first groove edge surface 16 will create a pressure on an outer edge 36 of the joining profile 3 when two adjacent panels are forced together, the pressure causing the intermediate section 33 to be urged downwards.

The upper side groove is provided with a first groove edge surface 16 and a second groove edge surface 17 between which first and second groove edge surfaces 16 and 17 respectively a predetermined distance D is present. The distance D is so configured that the snapping tongue 31 may be pressed in between the first and second groove edge surfaces 16 and 17 respectively. The first and second groove edge surfaces 16 and 17 respectively are arranged so that an undercut is present. The snapping tongue 31 of the joining profile 3 is adapted to the undercut so that a snap action locking effect is achieved. The simplest way to achieve such an undercut is through broaching or laser cutting.

Figure 4 shows an embodiment of a joining profile 3. The carrying base 3^B of the joining profile 3 is made of extruded aluminium. The top face of the carrying base 3^B is provided with grooves 3^G for elasticity. The top face 3^B is then coated with a decorative thermosetting laminate 3^S with hard particles in the surface for increased abrasion resistance.

Figure 5 shows in cross-section a joint for a panel according to a special embodiment of the present invention. Figure 5 shows the joint after the assembly. The joint is in figure 5 in relaxed state which it will have just after the assembly or when the panels have equilibrium moisture levels. The joint comprises a first edge 1 and a second edge 1^1 whereby the first edge 1 comprises a groove 11 and the second edge 1^1 is provided with a tongue 21. The tongue 21 is further provided with one protrusion 27 on the lower side of the tongue 21. The groove 11 is provided with a recess 18 arranged to mate with the protrusion 27. The tongue 21 and the groove 11 are configured to limit the movement in a vertical direction

between two adjacent panels while the protrusion 27 with matching recess 17 is configured to allow a predetermined movement in the horizontal plane. The second edge 1^I comprises a upper side groove 12. A joining profile 3 is provided with a tongue 31 and an intermediate section 33. The joining profile 3 is configured so as to allowing the tongue 31 to be fitted into upper side groove 12 during the manufacturing or before joining the panels. The joining profile 3 and the upper side grooves 12 are so configured that a play is created in the.

The joining profile is made of an elastic material, suitably a thermo-elastic or a natural rubber.

Figure 6 shows in cross-section a joint for a panel according to another embodiment of the present invention. Figure 6 shows the joint after the assembly. The joint comprises a first edge 1 and a second edge 1^I whereby the first edge 1 comprises an upper side groove 12. Also the second edge 1^I comprises a upper side groove 12. The first and second edges 1 and 1^I respectively are also provided with a lower side groove 12^L. In certain embodiments of the invention the lower side groove 12^L is only present on the second edge 1^I. A joining profile 3 is provided with a first and second snapping tongue 31^I and 31^{II} respectively, and an intermediate section 33. The first snapping tongue 31^I is further provided with a lower snapping tongue 31^L, allowing the joining profile 3 to be assembled on the first or second edge 1 and 1^I respectively, prior to assembling the panels. The joining profile 3 is configured so as to allowing the first and lower snapping tongue 31^I and 31^L respectively, to be fitted into the edge of a first panel after which panel with fitted joining profile is joined with another panel via the second, remaining, snapping tongue 31^{II} of the joining profile 3. It is advantageous to pre-assemble the joining profile 3 with the panel already in factory. The joining profile 3 is advantageously manufactured through means of extrusion moulding. It is suitable to make the material used for the snapping tongues 31^I, 31^{II} and 31^L of a comparatively stiff plastic material while the material in the intermediate section 33 is made of a comparatively soft and resilient material. The different material composition of the joining profile 3 is illustrated by the use of different cross-section hatching in figure 6. Among materials suitable for the manufacturing of a joining profile can be mentioned, polyolefins such as polyethylene and

polypropylene which may be modified with ethyl-vinyl-acetate (EVA) to achieve desired resilient and elastic properties.

The invention is not limited by the embodiments shown since they can be varied in different ways within the scope of the invention. The joining profile 3 may for example be made of a multiple of different materials such as a thermosetting or thermoplastic material, with or without filler materials and fibre for reinforcement. It is also possible to make the joining profile 3 of metal such as aluminium and steel. It is also possible to use combinations of materials such as aluminium and thermoplastic or thermo-elastic material. Finally the upper face of the joining profile may be decorated with a decorative material such as a thermosetting laminate, a thermoplastic foil, a solid wood, a metal foil, a lacquer, a transfer print, a natural rubber or a thermo-elastic material.